

Study of Antifertility Properties of *Catharanthus Roseus*

Ranjana Kumari

Research Scholar, University Department of Zoology, T. M. B. U. Bhagalpur, Bihar, India

ABSTRACT

C. roseus which belongs to Apocynaceae family. The whole plant part used as herbal medicine. It shows many pharmacological uses in medicinal world including antibacterial, antidiabetic, antioxidant, antihelminthic, antifeedent, antisterility, antidiarrheal and many more. In this review article we will discuss the antifertility property of *C. roseus*. It contains steroids, flavonoids and alkaloids etc. In term of antifertility, this plant effect on sertoli cells, leydig cells, steroidogenesis, antispermatogenic, antifertility, antiestrogenic, effect on sperm count, mortality, morphology.

KEYWORDS: *Catharanthus roseus*, Apocynaceae, antifertility, antispermatogenic, antiestrogenic, sperm count, sertoli cells

How to cite this paper: Ranjana Kumari "Study of Antifertility Properties of *Catharanthus Roseus*" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-7 | Issue-2, April 2023, pp.720-725, URL: www.ijtsrd.com/papers/ijtsrd55106.pdf



IJTSRD55106

Copyright © 2023 by author (s) and International Journal of Trend in Scientific Research and Development Journal. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0) (<http://creativecommons.org/licenses/by/4.0>)



INTRODUCTION

In recent times, the world is facing a big problem and that is over-population. Today India has achieved the first rank in the world for population. If we talk about the data today the population is more than 141 crore. We will get to see more increase in population in the coming times. So, it is very necessary to control as it is very harmful for our society, our Nation and also for our ecosystem.

In the present study, we will discuss the anti-fertility activity of medicinal plant of *C. roseus*. Anti-fertility means reducing fertility. Infertility is the inability of a male or female to procreate as a result of an issue with either partner's reproductive system. Infertility is mainly of two types i.e. Primary infertility and Secondary infertility. When a person is completely unable to procreate, that is primary infertility. Someone who has previously produced but is no longer able to does so with secondary infertility (Brazier, 2022). Oral contraceptives and anti-fertility medicines are both medications that regulate fertility. Birth control tablets contain a combination of oestrogen and progesterone. In males, it suppresses testosterone, inhibits spermatogenesis, affects the organ gonadotrophins or sperm viability (Daniyal & Akram, 2014). Many plant extracts can be used to make contraceptives and can reduce both male and

female fertility. Only a small number of medicinal herbs have so far been tested for their ability to suppress fertility, despite the fact that many of them have been claimed to do so. In addition, the World Health Organization (WHO) has established a task group on plant research to identify new non-steroidal contraceptive chemicals that are orally active (Montaserti et al., 2007).

For this review article, we are going to focus on antifertility property of *C. roseus*. Regulation No. 10 of 2014, which was published by the Indonesian National Agency of Drugs and Food Control, forbids the creation (manufacturing & distribution) of herbal medicines / supplements manufactured from *C. roseus*. This raises concerns and claims about whether *C. roseus* is a harmful plant (Indonesia National agency of Drugs and Food control, 2014). The alkaloids in *C. roseus* may lead to bone marrow depression, according to the regulation. It's interesting that numerous research point to *C. roseus* having a wide range of pharmacological effects (Sutrisna, 2015). As a well-known member of the Apocynaceae family of plants, *C. roseus* is a rich source of alkaloids that are found throughout the entire plant (Aslam et al., 2010). It's able to produce more than 100 monoterpenoid indole alkaloids

(MIAs), including the two most significant and commercially significant cytotoxic dimeric alkaloids used in cancer chemotherapy, made *C. roseus* one of the most utilised and studied medicinal plants (Magnotta et al., 2006). Vinblastine and vincristine, two of the main alkaloids found in *C. roseus*, were specifically used to create prescription anticancer medications (Duflos et al., 2002).

Traditional use

There are numerous pharmacological effects of *C. roseus*, a strong medicinal herb, including antibacterial, antioxidant, antihelminthic, antifeedant, antisterility, antidiarrheal, and antidiabetic effects (Gajalakshmi et al., 2013). In Northern Europe (Swanston-Flatt) and India, *C. roseus* leaves are frequently used as an anti-diabetic (Tiong et al., 2013). *C. roseus* leaf tea is used as an anti-diabetic in Brazil, Dominica, England, Cook Islands, Jamaica, Mozambique, Pakistan, Taiwan, Thailand, and the West Indies (Don, 1999). People in South Africa use *C. roseus* to treat urogenital infections (Fernandes et al., 2008), diabetic nephropathy (Zulu people) (Dauskardt, 1990), menorrhagia (Hutchings et al., 1996) and rheumatism (Marles & Farnsworth, 1995). This herb was utilised in Southern and Eastern Africa to treat various venereal illnesses (Watt & Breyer, 1962). *C. roseus* was utilised by the locals of Mutirikwi, Zimbabwe, to relieve stomach aches (Chigora et al., 2007). In the Kancheepuram District of Tamil Nadu, India Diabetes mellitus was treated with a decoction of *C. roseus* leaves (Muthu et al., 2006). Moreover, it has been used internally to treat conditions like memory loss, hypertension, cystitis, gastritis, enteritis, diarrhoea, and high blood sugar (Dessisa, 2001).

Materials and Methods

The material presented in this research is the outcome of a thorough bibliographic investigation that involved studying scholarly journals, classic textbooks, and internationally recognised databases. Peer-reviewed articles were acquired from a variety of sources, including PUBMED, Google Scholar, Webmed, Medical news today, Healthline, Review article and others.

This review focused on using *C. roseus*, which has been cited for its use as an antifertility agent in traditional medicine. It also includes plant extracts, which have already been demonstrated by numerous scientific articles.

Study

The name “Periwinkle” or “*Catharanthus roseus*” (Family Apocynaceae), often referred to as “Nayantara” or “Sadabahar,” comes from the Greek word which means “pure flower.” Whereas roseus is

Latin word which means “red,” “rose,” or “rosy” (Balaji, 2014).

Since the beginning of time, plant-based medications have been utilised for their effects on sex hormones, primarily for the suppression of fertility (Williamson et al., 1996). The male reproductive system is particularly sensitive to a variety of environmental influences, including lifestyle, medicines, radiation, pollution, and toxicants. As a result, congenital abnormalities in infants and functional changes in adults may follow (Saradha & Mathur, 2006). The process of male reproduction is complex and involves the testes, epididymis, accessory sex glands, and related hormones. Spermatogenesis and steroidogenesis, two highly ordered and complex processes carried out by the testes, are essential for the continuation of life. With the assistance of somatic sertoli cells, the highly dynamic and coordinated process of spermatogenesis develops mature spermatozoa from undifferentiated stem cells within the seminiferous tubules of the testis (Hess & Renato, 2008). The testis is well-equipped with strong intrinsic defensive mechanisms that shield the spermatozoa from harm from other intrinsic or external causes as well as during and after their spermatogenic and post-spermatogenic journeys (D'Cruz et al., 2010). Seminiferous tubules, Leyding cell nuclei, and epididymides all had much smaller nuclei, and sperm motility had significantly decreased as well. Reduced levels of sialic acid, fructose, and protein in the testicular and accessory organs are thought to be what caused the stoppage of spermatogenesis and androgen depletion (Parohit, 1999). Steroidogenesis takes place in the interstitial compartment, which is made up of Leydig cells (Ge et al., 2008). Following the spermatogenesis process, the spermatozoa travels from the testis to the ejaculatory ducts, experiencing a series of alterations that enable it to move, function, and connect with the zona pellucida of the female ovum (Litscher et al., 2009). When given to male rats, plant extracts have also demonstrated encouraging antifertility properties. Plants can have a variety of impacts on the male reproductive system to cause antifertility action, including antispermatogenic, post-testicular, spermicidal, sperm immobilising, antiandrogenic, etc (Shaik et al., 2017).

Through this review article we will try to know whether *C. roseus* shows antifertility activity which we can use as a herbal medicine for contraceptive. Apocynaceae family member *Catharanthus roseus* L. is a significant medicinal plant which is a dicotyledonous angiosperm (Ajaib et al., 2010). There are just two cultivars of *C. roseus* that are widely

available, and these are the pink-flowered “Rosea” and the white-flowered “Alba” (Jaleel & Panneerselvam, 2007). Two pharmacologically active substances derived from *C. roseus* or *V. rosea*, vincristin and vinblastin, have long been known to inhibit reproduction (Joshi & Ambaye, 1986 and Murugavel & Akbarsha, 1991). When *V. rosea* extracts were given to rats in a variety of doses, changes in the seminiferous tubule and a decrease in the percentage of primary spermatocytes, round spermatocytes, and elongated spermatids were observed (Bustos & Lopez, 1973).

Chemical constituent

Tannins, steroids, saponin glycosides, cardiac glycosides, anthraquinone glycosides, and flavonoids are all present in *C. roseus* (Yadav et al., 2013). It resulted in pathological alterations in the principal, apical, and nuclear cells of the caput and cauda, impairing epididymal functioning (Averal et al., 1996 and Murugavel et al., 1989). Apart than spermatogonia, it also affected spermatogenic cell lines (Murugavel & Akbarsha, 1991). *Catharanthus roseus* Linn. Leaf extract taken orally led to widespread testicular necrosis, tubule hyalinization, and scrotal cell-only syndrome. Studies on biochemistry found that the quantities of fructose and glycogen in reproductive organs had significantly decreased (Mathur & Chaudan, 1985).

C. roseus as medicinal herb for anti-fertility

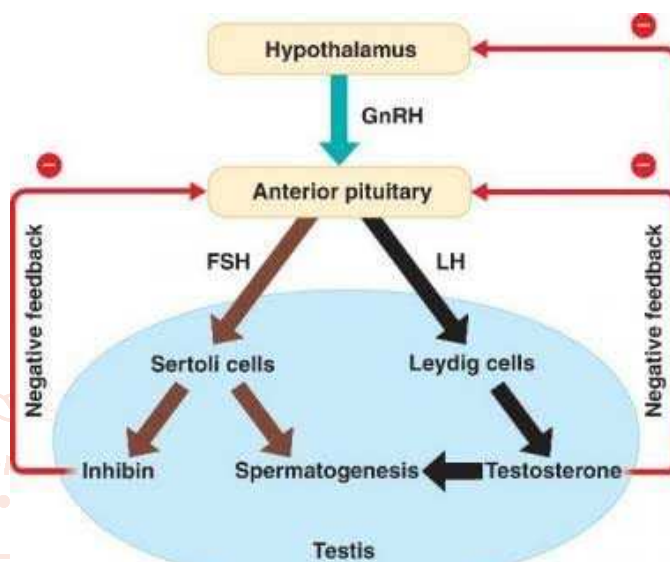
Effect on sertoli cells

Throughout adulthood, the somatic sertoli cells play a critical role in regulating the spermatogenesis process. By controlling the movement of essential nutrients and growth factors across the tight junctions, they support the development of the germ cells (Griswold, 1998). The quantity of sertoli cells also influences the rate and quality of spermatogenesis (Petersen & Soder, 2006). Consequently, any substance that impairs the sertoli cells' survival and functionality may have a significant impact on spermatogenesis (D'cruz et al., 2010).

Affect leydig cells and steroidogenesis

In addition to spermatogenesis, the testis also produces androgens, which are essential for maintaining spermatogenesis. The hypothalamus, pituitary gland, and testis are all involved in a feedback mechanism that controls the hormonal regulation of spermatogenesis (Sofikitis et al., 2008). Gonadotropin-releasing hormone, which is produced and secreted by the neurons of the hypothalamus,

triggers the generation and release of LH and FSH from the pituitary gland. LH triggers the creation of testosterone in the testis' Leydig cells, which has an adverse feedback effect on the pituitary and hypothalamus' release of hormones. As a result of FSH's action on sertoli cells, androgen-binding protein is produced, which facilitates testosterone transit through Sertoli-Sertoli junctional complexes (Dufau et al., 1984).



From Google

Antispermatic effect

In the male swiss albino mice, the *C. roseus* aqueous extract exerts antispermatic effects. The number of sperm and the proportion of motile sperm were lower in the mice treated with this extract than in the control group. The treated mice's dead sperm contained more than the control. Little activity was produced when male mice were given 0.2 ml/animal of a hot water extract of dried leaves (Murugavel et al., 1989). At 10.0 mg/animal, seminiferous tubules and Leydig cells regress, testicular cholesterol increases, and all germinal elements degenerate (Murugavel & Akbarsha, 1991). Male rats were given intraperitoneally active total alkaloids from whole plants (Joshi & Ambaye, 1968).

Antifertility effect

Male rats given an oral dose of a dried leaf and stem extract diluted in methanol and water (1:1) showed activity (Anon, 1979).

Affect sperm count, mortality & morphology

It lowers serum testosterone levels and sperm counts, which may result in infertility and death in users (Shaw et al., 2017).

Study of *C. roseus* in anti-fertility till date:

S. No	Plant part	Year	Animal modal	Extract	Effect	References
1.	Whole plant	1968	Male Rat	Alkaloids	Antifertility	Joshi and Ambaye
2.	Leaves	1983	Rat	Aqueous extract	Antispermato-genic activity	Chinoy and Ranga
3.	Leaves	1985	Mice	Aqueous extract	Antifertility efficacy	Mathur and Chaudan
4.	Leaves	1989	Mice	Aqueous extract	Antispermato-genic activity	Murugavel et al.
5.	Leaves	1991	Mice	Aqueous extract	Antispermato-genic	Murugavel and Akbarsha
6.	Leaves	1992	Albino Rat	Aqueous extract	Presence of multinucleated giant cells, spermatogenic arrest	Stanley and Akbarsha
7.	Whole plant	1993	Rat	Vincristine	Regression of entire reproductive system	Stanley et al.
8.	Whole plant	1995	Rat	Vincristine	Decrease in secretory activity of accessory sex gland	Akbarsha et al.
9.	Whole plant	1996	Rat	Vincristine	Epididymal dysfunction	Averal et al.
10.	Leaves	2009	Mice	Petroleum ether extract	Antiestrogenic activity	Gupta
11.	Whole plant	2017	Male Rats	Ethanollic extract	Antispermato-genic	Singh and Teotia
12.	Leaves	2017	Male Albino Rats	Aqueous extract	Antifertility	Shaw et al.
13.	Leaves	2019	Male wistar Rat	Vincristine	Depletion of sperm in epididymis	Sonawane et al.

Conclusion

C. roseus show different medicinal properties like antibacterial, antifungal, antiviral, antidiabetic and many more. It contains various alkaloids which are helpful in treatment of diseases. Plant is very effective and also easily available for any treatment of diseases. This review article focusses on detail study of anti-fertility property of *C. roseus*.

References

- [1] Ajaib M, Khan ZUD, Khan N. and Wahab M, 2010. Ethnobotanical studies on useful shrubs of District Kotli, Azad Jammu & Kashmir, Pakistan. *Pak J Bot.*; 42: 1407-1415.
- [2] Akbarsha MA, Stanley A and Averal HI, 1995. Effect of vincristine on Leydig cell and accessory reproductive organs, *Curr Sci*; 68(10): 1053-1057.
- [3] Anon, 1979. Antifertility studies on plants. Annual Report of the Director General –*Indian Council Med Res*; 71-72.
- [4] Aslam J., Khan S. H., Siddiqui Z. H., Fatima Z., Maqsood M., Bhat M. H., Nasim S. A., Ilah A., Ahmad I. J., Khan S. A., Mujib A., Sharma M. P. 2010. *Catharanthus roseus* (L.) G. Don. An important drug: It's application and production. *International Journal of Comprehensive Pharmacy*; 4(12).
- [5] Averal HI, Stanley A, Murugaian P, Polanisamy A and Akbarsha MA, 1996. Specific effect of vincristine on epididymis. *Indian Journal of Experimental Biology*; 34: 53-56.
- [6] Balaji Dr. H., Versatile, 2014. Therapeutic effects of *Vinca rosea* Linn. *International Journal of Pharmaceutical Science and Health Care*. 2014; 1(4): 59-76.
- [7] Brazier Y., 2022. Infertility in males and females, *Medical News Today*; (7), <https://www.medicalnewstoday.com/articles/165748>.
- [8] Bustos-Obregon E and Lopez ML, 1973. Selective effect of *Vinca rosea* L. alkaloids on type A4 rat spermatogonium. *Andrologie*; 5: 245–7.
- [9] Chigora P, Masocha R, and Mutenheri F., 2007. The role of indigenous Medicinal knowledge (IMK) in the treatment of ailments in rural Zimbabwe: The case of Mutirikwi communal lands. *J. Sustain. Dev. Afr.*; 9: 1520–5509.
- [10] Chinoy NJ and Ranga G, 1983. Antiandrogenic and antifertility effects of *Vinca rosea* Leaf extract, *Comp Physiol Ecol*; 8: 41-52.

- [11] Daniyal M., Akram M., 2014. Antifertility activity of medicinal plants, *Journal of the Chinese Medical Association*; 78: 382-388.
- [12] Dauskardt R., 1990. The changing geography of traditional medicine, urban Herbalism on the Witwatersrand, *South Africa. Geogr. J.*; 22: 257–283 <http://dx.doi.org/10.1007/bf00711339>.
- [13] D'Cruz S. C., Vaithinathan S., Jubendradass R. and Mathur P. P., 2010. Effects of plants and plant products on the testis, *Asian Journal of Andrology*; 12: 468-479.
- [14] Dessisa D, 2001. Preliminary economic evaluation of medicinal plants in Ethiopia: trade, volume and price In: Medhin Z, Abebe D, editors. Proceedings of the National Workshop on biodiversity Conservation and Sustainable use of Medicinal Plants in Ethiopia. Addis Ababa, Ethiopia; 176-188.
- [15] Don G. 1999. *Catharanthus roseus*, Medicinal plants of the world. Human Press, Totowa, NJ. 109–118.
- [16] Dufau ML, Winters CA, Hattori M, Aquilano D, Baranao JL, *et al.*, 1984. Hormonal regulation of androgen production by the Leydig cell. *J Steroid Biochem*; 20: 161–73.
- [17] Duflos A Kruczynski A, Barret JM, Novel, 2002. Aspects of natural and modified vinca alkaloids. *Current Medicinal Chemistry – Cancer Agents*; 2: 55–70.
- [18] Fernandes I, Van Rensburg CEJ, Hoosen AA and Steenkamp V., 2008. In vitro activity of medicinal plants of the Venda region, South Africa, Against *Trichomonas vaginalis*. *S. Afr. J. Epidemiol. Infect*; 23: 26–28.
- [19] Gajalakshmi S., Vijayalakshmi S. and Devi Rajeshwari V., 2013. Pharmacological activities of *Catharanthus roseus*: A perspective review. *International Journal of Pharma and Bio Sciences*; 4(2): 431-439.
- [20] Ge R, Chen G and Hardy MP, 2008. The role of the Leydig cell in spermatogenic function. *Adv Exp Med Biol*; 636: 255–69.
- [21] Griswold MD, 1998. The central role of Sertoli cells in spermatogenesis. *Semin Cell Dev Biol*; 9: 411–6.
- [22] Gupta P., 2009. Antiestrogenic activity of petroleum ether extract of the leaves of *Catharanthus roseus* (*Vinca rosea*) in female albino mice, *Asian J Exp Sci.*; 23(1): 313-316.
- [23] Hess RA and Renato de Franca L., 2008. Spermatogenesis and cycle of the seminiferous epithelium. *Adv Exp Med Biol*; 636: 1–15.
- [24] Hutchings A, Scott AH, Lewis G, and Cunningham AB., 1996. Zulu medicinal plants- An inventory. University of Natal Press, Pietermaritzburg.
- [25] Indonesia National agency of Drugs and Food control. Peraturan kepala badan pengawas obat dan makanan Republik Indonesia. Jakarta; 10: 1-4.
- [26] Jaleel CA and Panneerselvam R., 2007. Variations in the antioxidative and indole alkaloid status in different parts of two varieties of *Catharanthus roseus*: An important folk herb. *Chininese Journal of Pharmacology and Toxicology*; 1(6): 487- 494.
- [27] Joshi MS and Ambaye RY, 1968. Effect of alkaloids from *Vinca rosea* L. on spermatogenesis in male rats. *Indian J Exp Biol*; 6: 256–7.
- [28] Litscher ES, Williams Z, and Wassarman PM, 2009. Zona pellucida glycoprotein ZP3 and fertilization in mammals. *Mol Reprod Dev*; 76: 933–41.
- [29] Magnotta M, Murata J, Chen J, De Luca V, 2006. Identification of a low vindoline Accumulating cultivar of *Catharanthus Roseus* (L.) GDon. By alkaloid and Enzymatic profiling. *Phytochemistry*; 67: 1758–1764.
- [30] Marles RJ & Farnsworth NR. 1995. Antidiabetic plants and their active Constituents. *Phytomedicine.*; 2: 137–189 [http://dx.doi.org/10.1016/S0944-7113\(11\)80059-0](http://dx.doi.org/10.1016/S0944-7113(11)80059-0).
- [31] Mathur R and Chaudan S., 1985. Antifertility efficacy of *Catharanthus roseus* Linn: a biochemical and histological study. *Acta Eur Fertil.*; 16: 203-205.
- [32] Montaserti A, Pourheydar M, Khazaei M, Ghorbani R, 2007. Anti-fertility effects of physalis Alkekengi alcoholic extract in female rat. *Iran J Reprod Med*; 5(1): 13-16.
- [33] Murugavel T and Akbarsha MA, 1991. Antispermatic effect of *Vinca rosea*, *Indian Journal of Experimental Biology*; 29: 810-812.
- [34] Murugavel T and Akbarsha MA, 1991. Anti-spermatic effect of *Vinca rosea* Linn. *Indian J Exp Biol*; 29: 810–2.

- [35] Murugavel T, Ruknudin A, Thangauelu S and Akbarsha MA, 1989. Antifertility effect of *Vinca rosea* (linn.) leaf extract on male albino mice - A sperm parametric study. *Current Science*; 58: 1102-1103.
- [36] Muthu C, Ayyanar M, Raja N, and Ignacimuthu S., 2006. Medicinal plants used by traditional healers in Kancheepuram District of Tamil Nadu, India. *J. Ethnobiol. Ethnomed*; 2: 1–10 <http://dx.doi.org/10.1186/1746-4269-2-43>.
- [37] Parohit A., 1999. Antifertility efficacy of neem bark (*Azadirachta indica* A. juss.) in male rats. *Anc Sci Life*; 19: 21-4.
- [38] Petersen C and Soder O, 2006. The sertoli cell—a hormonal target and ‘super’ nurse for germ cells that determines testicular size. *Horm Res*; 66: 153–61.
- [39] Saradha B and Mathur PP, 2006. Effect of environmental contaminants on male reproduction. *Environ Toxicol Pharmacol*; 21: 34–41.
- [40] Shaik A., Yalavarthi P. R. and Bannothe C. K., 2017. Role of Anti-fertility Medicinal Plants on Male and Female Reproduction, *Journal of Complementary and Alternative Medical*; 3(2): 1-22.
- [41] Shaw K., Nandi K., Ganguly R., Roy C., 2017. Role of *Catharanthus roseus* Linn. (Neyantara) on sperm count and serum testosterone level of adult male albino rat, *World Journal of Pharmaceutical Research*; 6(15): 1087-1096.
- [42] Singh A and Teotia U. V. S., 2017. Evaluation of effect of *Catharanthus roseus*, *Solanum xanthocarpum* and *Momordica charantia* extract on reproductive system of male rats, *World Journal of Pharmaceutical Research*; 7: 706-715.
- [43] Sofikitis N., Giotitsas N, Tsounapi P, Baltogiannis D, Giannakis D and Pardalidis N, 2008. Hormonal regulation of Spermatogenesis and spermiogenesis. *J Steriod Biochem Mol Biol*; 109: 323–30.
- [44] Sonawane T., Azaz S., Hemant K., Liji T., 2019. Epididymal toxicity associated with Vincristine treatment, *Indian J Pharma Sci*; 81(3): 514-520.
- [45] Stanley A and Akbarsha MA, 1992. Giant spermatogonial cells generated by Vincristine and their uses, *Curr Sci*; 63: 144-147.
- [46] Stanley A, Averal HI and Akbarsha MA, 1993. Reproductive toxicity of vincristine in Male rats, *Indian J Exp Biol*; 31: 380-382.
- [47] Sutrisna E. 2015. *Catharanthus roseus* (Tapak Dara): “A controversial” medicinal plant in Indonesia. *Int. J. Res. Ayurveda Pharm.*; 6(5).
- [48] Tiong SH, Looi CY, Hazni H, Arya A, Paydar M, Wong WF, Cheah SC, Mustafa MR and Awang K, 2013. Antidiabetic and Antioxidant Properties of Alkaloids from *Catharanthus roseus* (L.) G. Don. *Molecules*; 18: 9770-9784 <http://dx.doi.org/10.3390/molecules18089770>.
- [49] Watt JM, and Breyer-Brandwijk MG., 1962. The Medicinal and Poisonous Plants of Southern and Eastern Africa. Second Edition, Livingstone, London. 25-100.
- [50] Williamson EM, Okpako DT and Evans FJ, 1996. Pharmacological methods in phytotherapy research: selection preparation and pharmacological evaluation of plant material. John Wiley and Sons Ltd., London; 1: 191-212.
- [51] Yadav PD, Bharadwaj NSP, Yedukondalu M, Methushala CH and Ravi Kumar A., 2013. Phytochemical evaluation of *Nyctanthes arborescens*, *Nerium oleander* and *Catharanthus roseus*. *Indian Journal of Research in Pharmacy and Biotechnology*; 1: 333-338.